

CLAIMS

1. A digital microphone comprising:
 - 5 a microphone housing having a sound inlet and comprising:
 - a transducer element comprising a displaceable diaphragm and adapted to generate a transducer signal representative of sound received through the sound inlet,
 - 10 - an analog-to-digital converter comprising a multi-level quantizer operatively coupled to the transducer means to convert the transducer signal into multi-bit samples representative of the transducer signal,
 - a digital signal converter adapted to convert the multi-bit samples into a single-bit
 - 15 output signal, and
 - an externally accessible terminal adapted to provide the single-bit output signal.
2. A digital microphone according to claim 1, wherein the analog-to-digital converter
20 comprises an oversampled delta-sigma modulator.
3. A digital microphone according to claim 1 or 2, comprising an integral clock generator operatively coupled to the analog-to-digital converter and the digital signal converter.
- 25 4. A digital microphone according to any of claims 1- 3, wherein the microphone housing comprises a second externally accessible terminal for receipt of an external clock signal.
5. A digital microphone according to claim 4, comprising DC voltage generating means disposed within the microphone housing and operatively coupled to the external clock
30 signal so as to derive a DC voltage supply for operating at least the analog-to-digital converter.
6. A digital microphone according to any of the preceding claims, wherein the multi-level quantizer of the analog-to-digital converter comprises between 3 and 64 discrete
35 quantization levels.

7. A digital microphone according to any of the preceding claims, wherein the multi-bit samples provided by the analog-to-digital converter are represented in two's complement format.

5

8. A digital microphone according to any of the preceding claims, wherein multi-bit samples generated by the multi-level quantizer are represented by a set of corresponding symbols, and

- wherein each symbol comprises a number of one signs which is proportional with a

10 magnitude of the corresponding multi-bit sample.

9. A digital microphone according to claim 8, wherein the multi-level quantizer comprises 3 or 5 discrete quantization levels.

15 10. A digital microphone according to claim 8 or 9, wherein the multi-level quantizer comprises N discrete quantization levels and each corresponding symbol comprises N-1 bits;

N being an integer between 3 and 17.

20 11. A digital microphone according to any of claims 8-10, wherein the digital signal converter comprises a delay circuit in cascade with an integer ratio upsampler.

12. A digital microphone according to any of the preceding claims, comprising a preamplifier interposed between the transducer element and the analog-to-digital

25 converter.

13. A digital microphone according to any of the preceding claims, comprising an interpolator operatively coupled between the multi-bit samples provided by the analog-to-digital converter and the digital signal converter.

30

14. A portable communication device comprising a digital microphone according to any of the preceding claims.

15. A monolithic integrated circuit for a miniature microphone, comprising

35

- a preamplifier adapted to provide an amplified transducer signal and comprising an input section couplable to a miniature electret or condenser transducer element,
- an analog-to-digital converter comprising a multilevel-quantizer operatively coupled to the amplified transducer signal and adapted to convert the amplified transducer signal into multi-bit samples representative of the amplified transducer signal,
- a digital signal converter adapted to convert the multi-bit samples into a single-bit output signal, and
- an integrated circuit pad adapted to provide the single-bit output signal.

16. A monolithic integrated circuit according to claim 15, wherein multi-bit samples generated by the multi-level quantizer are represented by a set of corresponding symbols, and

- wherein each symbol comprises a number of one signs which is proportional with a magnitude of the corresponding multi-bit sample.

17. A digital microphone according to claim 15 or 16, wherein the analog-to-digital converter comprises an oversampled delta-sigma modulator.

18. A monolithic integrated circuit according to any of claims 15 - 17, wherein the multi-level quantizer of the analog-to-digital converter comprises 3 or 5 discrete quantization levels.